

<p align="center">LLNL Environmental Restoration Division Standard Operating Procedure</p>	<p align="center">TITLE: Surface Soil Sampling</p>
<p>APPROVAL _____ Date _____</p> <p>Environmental Chemistry and Biology Group Leader</p>	<p>PREPARER: S. Gregory</p> <p>REVIEWERS: T. Carlsen, V. Dibley, J. Gardner*, and S. Nelson*</p>
<p>APPROVAL _____ Date _____</p> <p>Division Leader</p> <p>CONCURRENCE _____ Date _____</p> <p>QA Implementation Coordinator</p>	<p>PROCEDURE NUMBER: ERD SOP-1.12</p> <p>REVISION: 2</p> <p>EFFECTIVE DATE: December 1, 1995</p> <p align="center">Page 1 of 8</p>

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1.0 PURPOSE

To obtain a representative sample of surface soil in a manner which does not alter the composition or add any chemical or mineral constituents to the sample.

2.0 APPLICABILITY

This procedure is applicable to all personnel involved with the collection of surface soils for the purpose of defining the spatial distribution of surface soil contaminants such as volatile organic compounds (VOCs), fuel hydrocarbons, radiological compounds, metals, and high-explosive (HE) compounds. Surficial soil sampling is also done to determine background concentrations of naturally occurring substances. This SOP primarily covers surface soil sampling events which are independent of drilling operations, although the techniques described herein are also valid within that context. SOP 1.2, "Borehole Sampling of Unconsolidated Sediments and Rock," describes soil sampling during drilling in detail. Depending on the purpose of the sampling activity, modifications to these procedures can be made on a case by case basis and should be documented in a sampling plan.

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3.0 REFERENCES

- 3.1 LLNL Health and Safety Manual.
- 3.2 Operational Safety Procedures (OSPs).
- 3.3 Site 300 Site Safety Plan (SSP).
- 3.4 Livermore Site Safety Plan (SSP).
- 3.5 U.S. Environmental Protection Agency (1987), *A Compendium of Superfund Field Operations Methods*, EPA/540/P-87/001.
- 3.6 Webster-Scholten, C. P., Ed. (1994), *Final Site-Wide Remedial Investigation Report, Lawrence Livermore National Laboratory*, Livermore, CA. (UCRL-AR-108131).

4.0 DEFINITIONS

4.1 Surface Soil

Surface soil is defined as the top six inches of soil.

5.0 RESPONSIBILITIES

5.4 Data Management Group (DMG)

The DMG's responsibility is to decode the blind QC sample identification names on the analytical results, and distributing the data to appropriate personnel. DMG should also be consulted during sample plan preparation for creation of sample identifiers.

5.1 Division Leader

The Division Leader's responsibility is to ensure that all activities performed by ERD at the Livermore Site and Site 300 are performed safely and comply with all pertinent regulations and procedures, and provide the necessary equipment and resources to accomplish the tasks described in this procedure.

5.2 Environmental Chemistry and Biology Group Leader (ECBGL)

For surface soil sampling events conducted under the auspices of the Environmental Chemistry and Biology Group, the ECBGL's responsibility is to designate a project leader, and to review and approve all sampling plans. The ECBGL (in conjunction with the Hydrogeologic Group Leader (HGL), and/or Environmental Engineering Group Leader [EEGL]), is responsible for providing technical guidance and sampling plan review for surface soil sampling conducted in conjunction with drilling or other facility or study area projects.

5.5 Field personnel

The field personnel's responsibilities are to perform the sampling activities in accordance with approved SOPs and sampling plans.

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5.3 Sample Coordinator (SC)

The SC's responsibility is to ensure that samples are shipped to the appropriate analytical laboratory. The SC can also assist in obtaining release numbers for the required analyses.

5.6 Site Safety Officer (SSO)

The SSO's responsibility is to ensure the safety of ERD's ongoing operations and facilities and work performed.

5.3 Study Area Leader (SAL)/Facility Task Leader (FTL)/Project Leader (PL)

The SAL/FTL/PL's responsibilities are to:

- Prepare a surface soil sampling plan (to include input from the ECBGL, HGL, and/or EEGl, as appropriate) which details the types of analyses to be performed on surface soil samples.
- Provide the sampling plan to all sampling personnel.
- Determine the hazards (if any exist), and actions to be taken to ensure the safety of the personnel performing the sampling.
- Ensure that all field personnel have been fully trained.
- Obtain the appropriate release numbers for the analytical costs.

6.0 PROCEDURE

6.1 Sampling Plan Preparation

- 6.1.1 The SAL/FTL/PL (with input from the ECBGL) shall write a sampling plan which describes the number, and location(s) of the soil sample(s). The sampling plan is to include a QC sample list, which is prepared and distributed as specified by SOP 4.9, "Collection of QA/QC Samples." Sample locations should be named according to the procedures outlined in SOP 4.2, "Sample Control and Documentation."
- 6.1.2 The SAL/FTL/PL (with input from the ECBGL) shall select the appropriate laboratory analytical methods based upon contaminant history, site operations history, and any investigation requirements.

6.2 Office Preparation

- 6.2.1 Meet with the SAL/FTL/PL, ECBGL, and SSO to exchange information as to the expected types and concentrations of contaminants that may be encountered and to determine if any personal protective equipment (PPE) is necessary.
- 6.2.2 Obtain a copy of the Sampling Plan.
- 6.2.3 Review SOP 4.1, "General Instructions for Field Personnel." Arrange for access to sampling areas through building coordinators, control point operators, security, or other appropriate personnel.

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- 6.2.4 Inventory all field equipment listed in the Equipment Checklist (Attachment A) and load into field vehicle.

6.3 Field Preparation

- 6.3.1 Charge and calibrate field equipment such as photoionization detectors or flame ionization detectors.
- 6.3.2 Ensure that all sampling equipment has been decontaminated according to SOP 4.5, "General Equipment Decontamination."
- 6.3.3 Locate sampling locations and determine the best sampling order. Sample from least contaminated area to most contaminated area whenever possible. If site historical data is unavailable, sample from the areas furthest from site operations, considered background, to areas closest to operations.
- 6.3.4 Before traveling off pavement (by foot or vehicle) at Site 300, obtain permission from the appropriate personnel (e.g., the control point operator, Sierra 45 or security, Mike) by portable radio, as described in SOP 4.1. Keep a radio with you at all times. Only 4-wheel drive vehicles are allowed off pavement at Site 300.

6.4 Operation

- 6.4.1 Determine the location to be sampled and drive a labeled stake into the ground adjacent to where the soil will be collected.
- 6.4.2 Using a clean trowel, clear an area of vegetation large enough to supply the quantity of soil that will be needed for all analytical requirements. Usually a one ft² area is sufficient. Avoid removing the top soil when scraping off the vegetation.
- 6.4.3 If samples are to be analyzed for volatile chemical constituents, such as those using analytical methods EPA 8010, 8020, or 8240, a sampling device which limits the exposure of the matrix to air should be used if at all possible. The following procedure should be followed:
 - A. Using a soil sampling device, such as a slide hammer with cup and cap assembly, insert a clean liner into the cup, and drive the cup into the soil within the cleaned area. The cup is driven at a 45° angle to ensure the sampler does not obtain any soil from depths greater than six inches. The cup needs to be driven until it is certain that there is no air space remaining inside the cup assembly. The liner may be composed of either stainless steel or brass depending on the analysis being performed.
 - B. Retrieve the cup from the ground and remove the liner filled with surface soil being careful not to let any of the soil fall out of the liner. Quickly inspect each end of the liner to ensure the soil extends to the end of the liner. Then place a square of Teflon tape over the end of the tube followed by a plastic end cap. Repeat this for the other end of the tube and secure caps to the liner using duct tape to prevent the caps from falling off during shipment.
 - C. Label the soil tube with the same identifier used to stake the location. Put sample in a air tight bag, and place in an ice chest at 4°C (SOP 4.4, "Guide to the Handling, Packaging, and Shipping of Samples").

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D. If it is not possible to use a slide hammer sampling devise, samples may be collected by either directly driving a brass tube into the soil by hand or with a hammer, or by tightly packing soil into a glass jar. This should be performed quickly to prevent the loss of VOCs. Labeled and place on ice as described above.

6.4.4 Samples being analyzed for non-volatile chemical constituents or physical characteristics may be collected without concern about the exposure to air. The following procedure should be followed:

A. Using the trowel, chop and stir up the soil within the cleared area down to about 6 inches. It should be thoroughly mixed up to ensure that a representative composite sample can be collected.

B. Fill the appropriate number of containers as determined by the analytical requirements (SOP 4.3, "Sample Containers and Preservation"). A Teflon-lined lid or cap should be used to seal the container. If these are not available, Teflon sheeting may be placed over the top of the container prior to sealing with a conventional cap. The cap should be taped in place to prevent it from coming off during shipment.

C. Label the container as described above. Place the sample in a air tight bag and in an ice chest at 4°C (SOP 4.4).

6.4.5 Record all pertinent information in the document control logbook including sample ID, location description, the number and types of samples collected (SOP 4.2).

6.4.6 Mark the sampling location and ID on a topographic site map as accurately as possible. The locations coordinates can either be accurately determined through surveying or estimated using the computer application MacX or by accessing the Hot Maps file through Netscape.

6.4.7 Decontaminate the slide hammer assembly and/or trowel (SOP 4.5) prior to moving to the next sampling location. Equipment used in background locations and those locations not containing organic contaminants can be decontaminated just by thoroughly rinsing with deionized water and drying with a clean cloth.

6.5 Field Post Operation

6.5.1 Complete Chain-of-Custody (CoC) form as per SOP 4.2. Compare samples collected to the Sampling Plan to ensure the correct number and type of samples were obtained.

6.5.2 Review the Document Control Logbook to ensure that all necessary information has been recorded.

6.5.3 Decontaminate all equipment according to SOP 4.5. Store the equipment in clean storage containers until the next sampling event.

6.5.4 If the samples are to go to an off-site analytical laboratory, deliver samples and completed CoC forms to the lock box. If the samples are to be analyzed on site or need to be shipped, deliver samples and CoC forms to the SC for shipment or delivery to the on-site laboratory (SOP 4.4).

6.5.6 Deliver a copy of the completed CoC to the Data Management Group (DMG).

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6.6 Office Post Operation

- 6.6.1 Review field logbook and forms for completeness.
- 6.6.2 Deliver logbook to the Document Control Officer and a copy of the CoCs to the DMG.

7.0 QA RECORDS

- 7.1 Document Control Logbook
- 7.2 Chain-of-Custody Forms

8.0 ATTACHMENTS

Attachment A—Equipment Checklist

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Attachment A

Equipment Checklist

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Equipment Checklist

- _____ Air-tight plastic bags
- _____ Alconox (detergent)
- _____ Appropriate documents (i.e., Sampling Plan, SOPs, QAPP, Site Safety Plan)
- _____ Backpack
- _____ Brushes
- _____ De-ionized water
- _____ Disposable towels
- _____ Fluorescent marker tape
- _____ Gloves (leather, vinyl, and/or Nitril)
- _____ Ice chest and ice
- _____ Logbook
- _____ Maps
- _____ Permanent ink markers
- _____ Portable 2-way radio
- _____ Sample containers
- _____ Shovel
- _____ Sledge hammer
- _____ Stakes
- _____ Trash bags
- _____ Trowel
- _____ Split spoon sampler and slide hammer
- _____ Snake chaps
- _____ FID or PID or other appropriate monitoring devices
- _____ Appropriate attire (i.e., coveralls, hat, etc.)
- _____ Drinking water